GEOLOGIC HISTORY OF LOWELL IMPACT. J. H. Lias, J. M. Dohm, and K. L. Tanaka, U.S. Geological Survey, Flagstaff, AZ; 86001; jlias@flagmail.wr.usgs.gov.

INTRODUCTION. A pristine, double-ring impact crater, Lowell, is south of the Thaumasia highlands in the southern hemisphere of Mars (Fig. 1). The diameter of the outer ring is 195 km and the inner ring is about 85 km. The crater and its asymmetric ejecta blanket, which extends from the rim an average of 180 km to the northwest and southeast and 110 km to the northeast and southwest, are superposed on an Early Hesperian smooth unit of the plateau sequence (unit Hpl3; [1]). Numerous secondaries from the Lowell event are observed on all surrounding Middle Noachian to Early Amazonian rock outcrops (units Npl1, ANade, Hpl3, AHade, Apd) as much as 805 km from the crater rim (to the northwest).

STRATIGRAPHIC RELATIONS. The impact structure and its related deposits and secondaries, surrounding rock units, and local faults of Claritas Fossae were mapped and their stratigraphic relations determined using Viking images. The materials of the region have been divided into six units. The units are assigned to the formal stratigraphic systems (Noachian, Hesperian, and Amazonian [2]) and series (upper, middle, and lower divisions of systems [3]). To determine the material and modificational ages of the rock units, we compiled crater statistics for four units to better constrain the Lowell impact event (Table 1). The crater statistics consist of total crater populations (including buried, degraded, and pristine impacts), which may indicate emplacement ages, and superposed craters only, which indicate ages of the last period of major resurfacing. The dissected materials include the eroded rock and superposed sediment deposited by the resurfacing agent, because they generally cannot be mapped separately.

The key stratigraphic relations, which are supported in part by crater statistics (Table 1), include: (1) Lowell crater is Late Hesperian/Early Amazonian and is superposed on the Early Hesperian smooth unit (unit Hpl3) and other older outcrops, (2) Lowell secondaries occur on all surrounding materials including Late Hesperian/Early Amazonian deposits (units ANade and AHade), (3) Early Amazonian channels dissect Noachian and Hesperian materials to the northeast and southwest, respectively, (4) Early to Middle Hesperian faults of Claritas Fossae [4] are buried by Lowell ejecta, and (5) an Early Amazonian massive plains deposit (unit Apd) southeast of Lowell, which may be an impact-related debris flow, embays and partly buries wrinkle ridges, faults of Claritas Fossae, craters, and older rock outcrops.

GEOLOGIC HISTORY. Crater statistics indicate a Late Hesperian/Early Amazonian age for Lowell, making it one of the youngest multiring basins on Mars [3]. The impact triggered a series of events, which include: (1) formation of secondary craters on surrounding rock outcrops in the Lowell and Thaumasia regions, (2) channel dissection of rock outcrops to the northeast and southwest, and (3) a massive debris flow, which embayed and partly buried structure to the southeast.

References. [1] Scott, D.H. and Tanaka, K.L. (1986) *USGS Map I-1802A*. [2] Scott, D.H. and Carr , M.H. (1978) *USGS Map I-1083*. [3] Tanaka, K.L. (1986) *JGR*, *E139*. [4] Dohm, J.M. and Tanaka, K.L. (1996) *LPSC Abs. 27*, 315.

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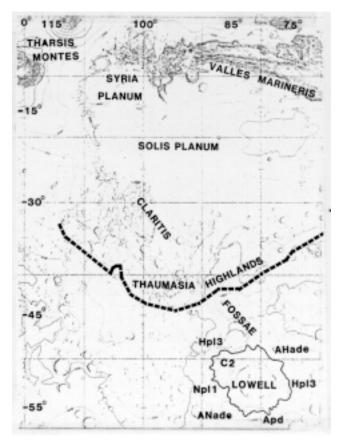


Fig. 1. Index map of Lowell impact crater and surrounding geology.

TABLE 1. Cumulative crater densities and surface and unit ages in the Lowell region of Mars.

			Density of Craters (No. \geq 5 km/10 ⁶ km ²)		Relative Age ¹	
Unit	Symbol	Area (km ²)	Superposed	Total number	Resurface ³	Material Age
Lowell ejecta blanket	C2	325,984	64 ± 14	135 ± 20	LH-EA	EH
Plains deposit	Apd	161,940	31 ± 16	31 ± 16	EA	EA
SW dissected material	ANade	89,512	56 ± 25	313 ± 38	LH-EA	MN-LN
NE dissected material	AHade	82,376	49 ± 24	121 ± 38	LH-EA	EH-LH

¹Relative crater ages based on [3]; N = Noachian, H = Hesperian, A = Amazonian, E = Early, M = Middle, and L = Late.

²Total number of superposed and highly eroded and partly buried craters.

³Relative age of fluvial-, impact-, and possible mass movement-related processes.